

## CLAIMS

1. A method of cutting a semiconductor substrate, the method comprising the steps of:

irradiating a semiconductor substrate having a sheet bonded thereto by way of a die-bonding resin layer with laser light while locating a light-converging point within the semiconductor substrate, so as to form a modified region caused by multiphoton absorption within the semiconductor substrate, and causing the modified region to form a part which is intended to be cut; and

expanding the sheet after the step of forming the part which is intended to be cut, so as to cut the semiconductor substrate and die-bonding resin layer along the part which is intended to be cut.

2. A method of cutting a semiconductor substrate, the method comprising the steps of:

irradiating a semiconductor substrate having a sheet bonded thereto by way of a die-bonding resin layer with laser light while locating a light-converging point within the semiconductor substrate under a condition with a peak power density of at least  $1 \times 10^8$  (W/cm<sup>2</sup>) at the light-converging point and a pulse width of 1  $\mu$ s or less, so as to form a modified region including a molten processed region within the semiconductor substrate, and causing the modified region including the molten processed region to form a part which is intended to be cut; and

expanding the sheet after the step of forming the part which is intended to be cut, so as to cut the semiconductor substrate and die-bonding resin layer along the part which is intended to be cut.

3. A method of cutting a semiconductor substrate, the method comprising the steps of:

irradiating a semiconductor substrate having a sheet bonded thereto by way of a die-bonding resin layer with laser light while locating a light-converging point within the semiconductor substrate, so as to form a modified region within the semiconductor substrate, and causing the modified region to form a part which is intended to be cut; and

expanding the sheet after the step of forming the part which is intended to be cut, so as to cut the semiconductor substrate and die-bonding resin layer along the part which is intended to be cut.

4. A method of cutting a semiconductor substrate, the method comprising the steps of:

irradiating a semiconductor substrate having a sheet bonded thereto with laser light while locating a light-converging point within the semiconductor substrate, so as to form a modified region within the semiconductor substrate, and causing the modified region to form a part which is intended to be cut; and

expanding the sheet after the step of forming the part which is intended to be cut, so as to cut the semiconductor substrate along the part which is intended to be cut.

5. A method of cutting a semiconductor substrate according to claim 3 or 4, wherein the modified region is a molten processed region.

6. A method of cutting a semiconductor substrate according to one of claims 1 to 4, wherein a fracture is caused to reach a front face of the semiconductor substrate on the laser light entrance side from the part which is intended to be cut acting as a start point.

7. A method of cutting a semiconductor substrate according to one of claims 1 to 4, wherein a fracture is caused to reach a rear face of the

semiconductor substrate on the side opposite from the laser light entrance side from the part which is intended to be cut acting as a start point.

8. A method of cutting a semiconductor substrate according to one of claims 1 to 4, wherein a fracture is caused to reach a front face of the semiconductor substrate on the laser light entrance side and a rear face on the side opposite therefrom from the part which is intended to be cut acting as a start point.

9. A method of cutting a semiconductor substrate, the method comprising the steps of:

irradiating a semiconductor substrate having a sheet bonded thereto by way of a die-bonding resin layer with laser light while locating a light-converging point within the semiconductor substrate, so as to form a modified region caused by multiphoton absorption within the semiconductor substrate, and causing the modified region to form a part which is intended to be cut;

generating a stress in the semiconductor substrate along the part which is intended to be cut after the step of forming the part which is intended to be cut, so as to cut the semiconductor substrate along the part which is intended to be cut; and

expanding the sheet after the step of cutting the semiconductor substrate, so as to cut the die-bonding resin layer along a cut section of the semiconductor substrate.

10. A method of cutting a semiconductor substrate, the method comprising the steps of:

irradiating a semiconductor substrate having a sheet bonded thereto by way of a die-bonding resin layer with laser light while locating a light-converging point within the semiconductor substrate under a condition with a

peak power density of at least  $1 \times 10^8$  (W/cm<sup>2</sup>) at the light-converging point and a pulse width of 1  $\mu$ s or less, so as to form a modified region caused by multiphoton absorption within the semiconductor substrate, and causing the modified region to form a part which is intended to be cut;

5           generating a stress in the semiconductor substrate along the part which is intended to be cut after the step of forming the part which is intended to be cut, so as to cut the semiconductor substrate along the part which is intended to be cut; and

10           expanding the sheet after the step of cutting the semiconductor substrate, so as to cut the die-bonding resin layer along a cut section of the semiconductor substrate.

11.   A method of cutting a semiconductor substrate, the method comprising the steps of:

15           irradiating a semiconductor substrate having a sheet bonded thereto by way of a die-bonding resin layer with laser light while locating a light-converging point within the semiconductor substrate, so as to form a modified region within the semiconductor substrate, and causing the modified region to form a part which is intended to be cut;

20           generating a stress in the semiconductor substrate along the part which is intended to be cut after the step of forming the part which is intended to be cut, so as to cut the semiconductor substrate along the part which is intended to be cut; and

25           expanding the sheet after the step of cutting the semiconductor substrate, so as to cut the die-bonding resin layer along a cut section of the semiconductor substrate.

12.   A method of cutting a semiconductor substrate according to claim 11,

wherein the modified region is a molten processed region.

13. A method of cutting a semiconductor substrate having a front face formed with a functional device along a line to cut, the method comprising the steps of:

5           irradiating the semiconductor substrate with laser light while using a rear face of the semiconductor substrate as a laser light entrance surface and locating a light-converging point within the semiconductor substrate, so as to form a modified region, and causing the modified region to form a cutting start region within the semiconductor substrate inside of the laser light entrance  
10           surface by a predetermined distance along the line to cut;

          attaching an expandable holding member to the rear face of the semiconductor substrate by way of a die-bonding resin layer after forming the cutting start region; and

          expanding the holding member after attaching the holding member,  
15           so as to cut the semiconductor substrate and die-bonding resin layer along the line to cut.

14. A method of cutting a semiconductor substrate according to claim 13, further comprising the step of grinding the rear face of the semiconductor substrate such that the semiconductor substrate attains a predetermined  
20           thickness before forming the cutting start region.

15. A method of cutting a semiconductor substrate according to claim 13 or 14, wherein the modified region includes a molten processed region.

16. A method of cutting a semiconductor substrate according to one of claims 13 to 15, wherein a fracture is caused to reach the front face of the  
25           semiconductor substrate from the cutting start region acting as a start point when forming the cutting start region.

17. A method of cutting a semiconductor substrate according to one of claims 13 to 15, wherein a fracture is caused to reach the rear face of the semiconductor substrate from the cutting start region acting as a start point when forming the cutting start region.
- 5 18. A method of cutting a semiconductor substrate according to one of claims 13 to 15, wherein a fracture is caused to reach the front and rear faces of the semiconductor substrate from the cutting start region acting as a start point when forming the cutting start region.